

## 1A Low Dropout Positive Adjustable or Fixed-Mode Regulator

### ■ Features

- 1.4V maximum dropout at full load current
- Fast transient response
- Output current limiting
- Built-in thermal shutdown
- Packages: SOT223, TO263, TO252, TO220, SOT89
- Good noise rejection
- 3-Terminal Adjustable or Fixed 1.5V, 1.8V, 1.9V, 2.5V, 3.3V, 5.0V

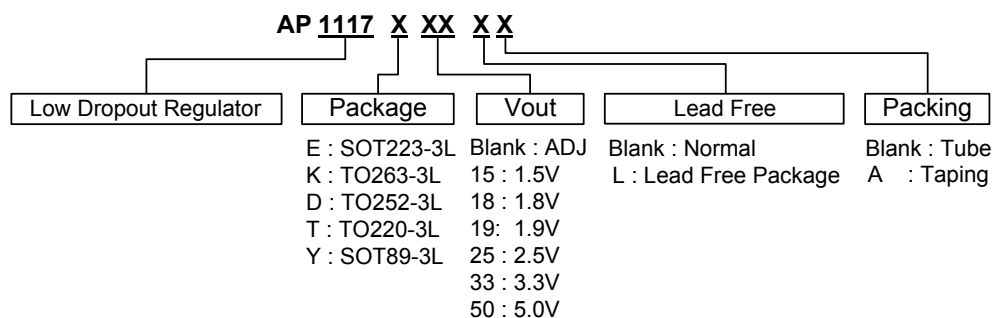
### ■ Applications

- PC peripheral
- Communication

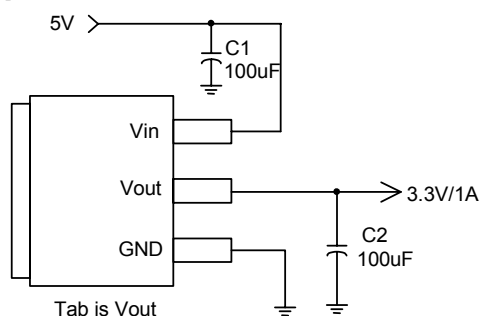
### ■ General Description

AP1117 is a low dropout positive adjustable or fixed-mode regulator with minimum of 1A output current capability. The product is specifically designed to provide well-regulated supply for low voltage IC applications such as high-speed bus termination and low current 3.3V logic supply. AP1117 is also well suited for other applications such as VGA cards. AP1117 is guaranteed to have lower than 1.4V dropout at full load current making it ideal to provide well-regulated outputs of 1.25 to 5.0 with 6.4V to 12V input supply.

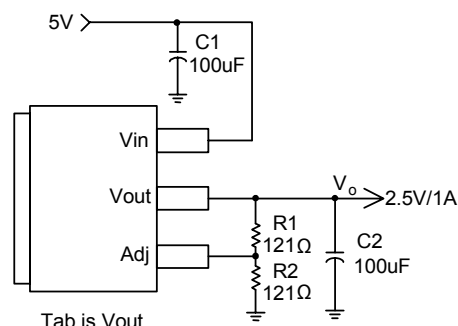
### ■ Ordering Information



### ■ Typical Circuit



( 5V/3.3V fixed output )

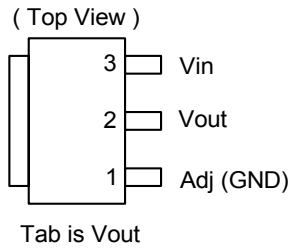


( 5V/2.5V ADJ output )

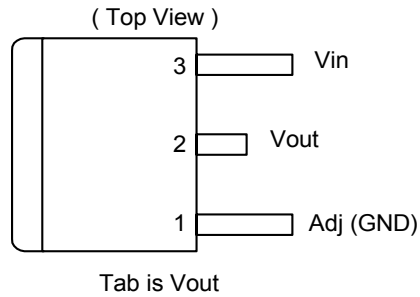
$$\text{Note: } V_o = V_{\text{REF}} * \left(1 + \frac{R_2}{R_1}\right)$$

### ■ Connection Diagram

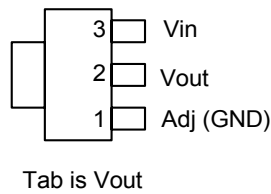
**3 PIN SOT223**



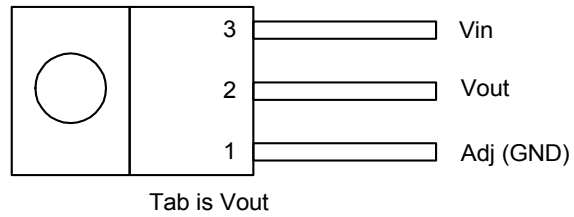
**3 PIN TO252 / TO263**



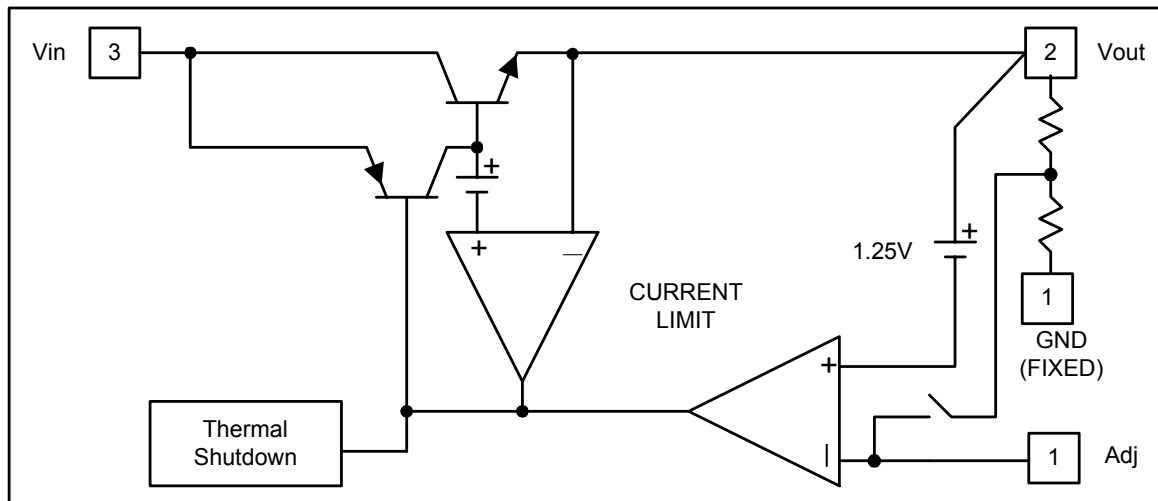
**3 PIN SOT89**



**3 PIN TO220**



### ■ Block Diagram



**■ Pin Descriptions**

NAME	I/O	PIN #	FUNCTION
Adj (GND)	I	1	A resistor divider from this pin to the Vout pin and ground sets the output voltage. (Ground only for Fixed-Mode)
Vout	O	2	The output of the regulator. A minimum of 10uF capacitor ( $0.15\Omega \leq \text{ESR} \leq 20\Omega$ ) must be connected from this pin to ground to insure stability.
Vin	I	3	The input pin of regulator. Typically a large storage capacitor ( $0.15\Omega \leq \text{ESR} \leq 20\Omega$ ) is connected from this pin to ground to insure that the input voltage does not sag below the minimum dropout voltage during the load transient response. This pin must always be 1.3V higher than Vout in order for the device to regulate properly.

**■ Absolute Maximum Ratings**

Symbol	Parameter	Rating	Unit
Vin	DC Supply Voltage	-0.3 to 12	V
P <sub>D</sub>	Power Dissipation	Internally Limited	
T <sub>ST</sub>	Storage Temperature	-65 to +150	°C
T <sub>OP</sub>	Operating Junction Temperature Range	0 to +150	°C



## 1A Low Dropout Positive Adjustable or Fixed-Mode Regulator

### ■ Electrical Characteristics (Under Operating Conditions)

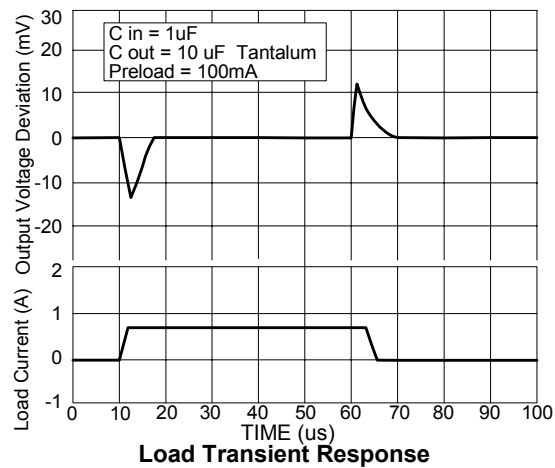
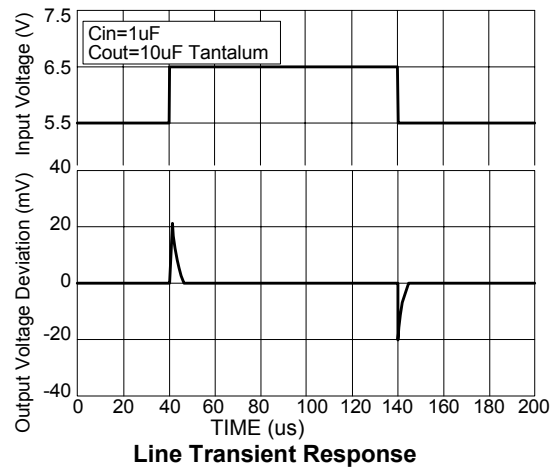
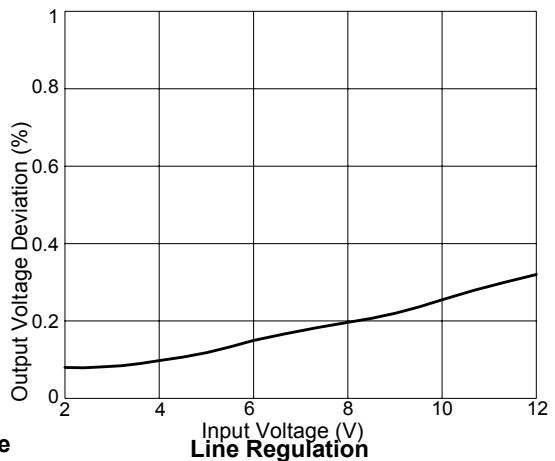
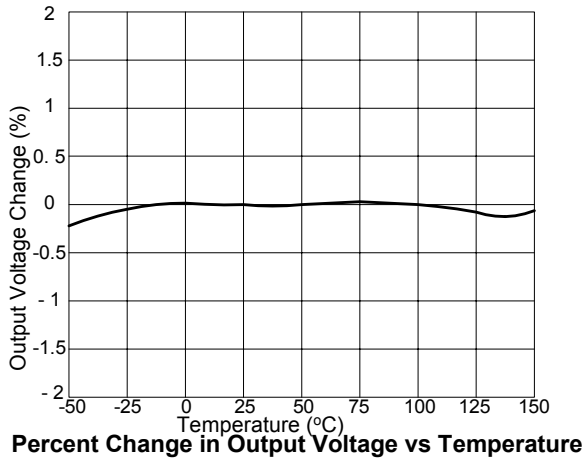
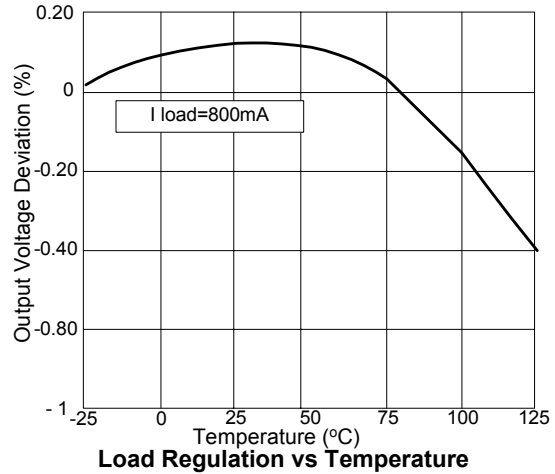
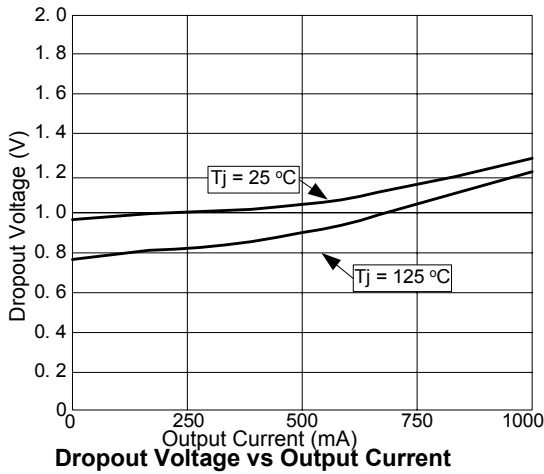
PARAMETER	CONDITIONS		MIN	TYP	MAX	UNIT
Reference Voltage	AP1117-ADJ	$T_J=25^{\circ}\text{C}, (V_{IN}-V_{OUT})=1.5\text{V}$ $I_O=10\text{mA}$	1.225	1.250	1.275	V
Output Voltage	AP1117-1.5	$I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$ $3\text{V} \leq V_{IN} \leq 12\text{V}$	1.470	1.500	1.530	V
	AP1117-1.8	$I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$ $3.3\text{V} \leq V_{IN} \leq 12\text{V}$	1.764	1.800	1.836	V
	AP1117-1.9	$I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$ $3.3\text{V} \leq V_{IN} \leq 12\text{V}$	1.862	1.900	1.938	V
	AP1117-2.5	$I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$ $4\text{V} \leq V_{IN} \leq 12\text{V}$	2.450	2.500	2.550	V
	AP1117-3.3	$I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$ $4.8\text{V} \leq V_{IN} \leq 12\text{V}$	3.235	3.300	3.365	V
	AP1117-5.0	$I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$ $6.5\text{V} \leq V_{IN} \leq 12\text{V}$	4.900	5.000	5.100	V
Line Regulation	AP1117-XXX	$I_O=10\text{mA}, V_{OUT}+1.5\text{V}<V_{IN}<12\text{V},$ $T_J=25^{\circ}\text{C}$			0.2	%
Load Regulation	AP1117-ADJ	$V_{IN}=3.3\text{V}, V_{adj}=0, I_O<1\text{A},$ $T_J=25^{\circ}\text{C}$ (Note 1,2)			1	%
	AP1117-1.5	$V_{IN}=3\text{V}, 0\text{mA}<I_O<1\text{A},$ $T_J=25^{\circ}\text{C}$ (Note 1,2)		12	15	mV
	AP1117-1.8	$V_{IN}=3.3\text{V}, 0\text{mA}<I_O<1\text{A},$ $T_J=25^{\circ}\text{C}$ (Note 1,2)		15	18	mV
	AP1117-1.9	$V_{IN}=3.3\text{V}, 0\text{mA}<I_O<1\text{A},$ $T_J=25^{\circ}\text{C}$ (Note 1,2)		16	19	mV
	AP1117-2.5	$V_{IN}=4\text{V}, 0\text{mA}<I_O<1\text{A},$ $T_J=25^{\circ}\text{C}$ (Note 1,2)		20	25	mV
	AP1117-3.3	$V_{IN} = 5\text{V}, 0 \leq I_{OUT} \leq 1\text{A},$ $T_J=25^{\circ}\text{C}$ (Note 1,2)		26	33	mV
	AP1117-5.0	$V_{IN} = 8\text{V}, 0 \leq I_{OUT} \leq 1\text{A},$ $T_J=25^{\circ}\text{C}$ (Note 1,2)		40	50	mV
Dropout Voltage ( $V_{IN}-V_{OUT}$ )	AP1117-ADJ/1.5/1.8 /1.9/2.5/3.3/5.0	$I_{OUT} = 1\text{A}, \Delta V_{OUT}=0.1\%V_{OUT}$		1.3	1.4	V
Current Limit	AP1117-ADJ/1.5/1.8 /1.9/2.5/3.3/5.0	$(V_{IN}-V_{OUT}) = 5\text{V}$	1.1			A
Minimum Load Current	AP1117-XXX	$0^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$		5	10	mA
Thermal Regulation	$T_A=25^{\circ}\text{C}, 30\text{ms pulse}$			0.008	0.04	%/W
Ripple Rejection	$F=120\text{Hz}, C_{OUT}=25\mu\text{F Tantalum}, I_{OUT}=1\text{A}$					
	AP1117-XXX	$V_{IN}=V_{OUT}+3\text{V}$		60	70	dB
Temperature Stability	$I_O=10\text{mA}$			0.5		%
$\theta_{JA}$ Thermal Resistance Junction-to-Ambient(No heat sink ;No air flow)	SOT89			300		$^{\circ}\text{C/W}$
	SOT-223			117		
	TO-252			92		
	TO-220/263			85		
$\theta_{JC}$ Thermal Resistance Junction-to-Case	SOT89 : Control Circuitry/Power Transistor			100		$^{\circ}\text{C/W}$
	SOT-223 : Control Circuitry/Power Transistor			15		
	TO-263 : Control Circuitry/Power Transistor			0.65/2.7		
	TO-252 : Control Circuitry/Power Transistor			10		
	TO-220 : Control Circuitry/Power Transistor			0.65/2.7		

Note1: See thermal regulation specifications for changes in output voltage due to heating effects. Line and load regulation are measured at a constant junction temperature by low duty cycle pulse testing. Load regulation is measured at the output lead = 1/18" from the package.

Note2: Line and load regulation are guaranteed up to the maximum power dissipation of 15W. Power dissipation is determined by the difference between input and output differential and the output current. Guaranteed maximum power dissipation will not be available over the full input/output range.

Note3: Quiescent current is defined as the minimum output current required in maintaining regulation. At 12V input/output differential the device is guaranteed to regulate if the output current is greater than 10mA.

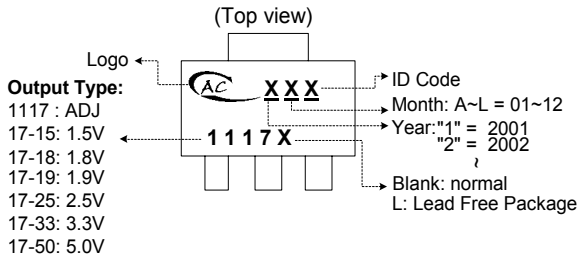
### ■ Typical Performance Characteristics



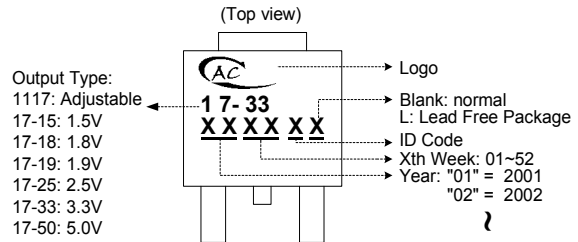
## 1A Low Dropout Positive Adjustable or Fixed-Mode Regulator

### ■ Marking Information

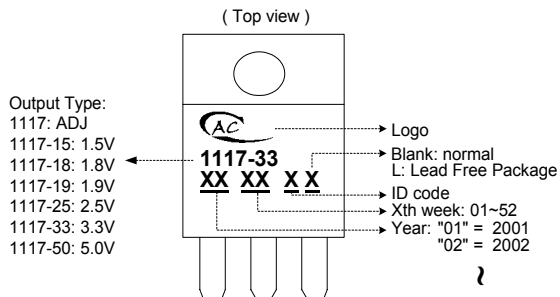
(1) SOT223-3L



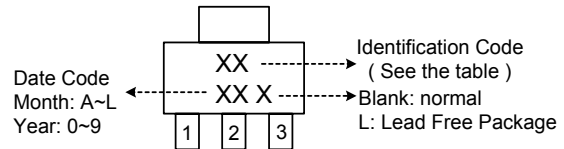
(2) TO252-3L



(3) TO220-3L

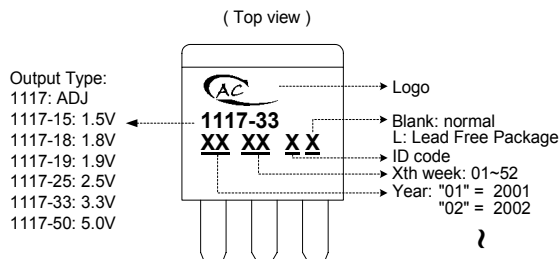


(4) SOT89-3L



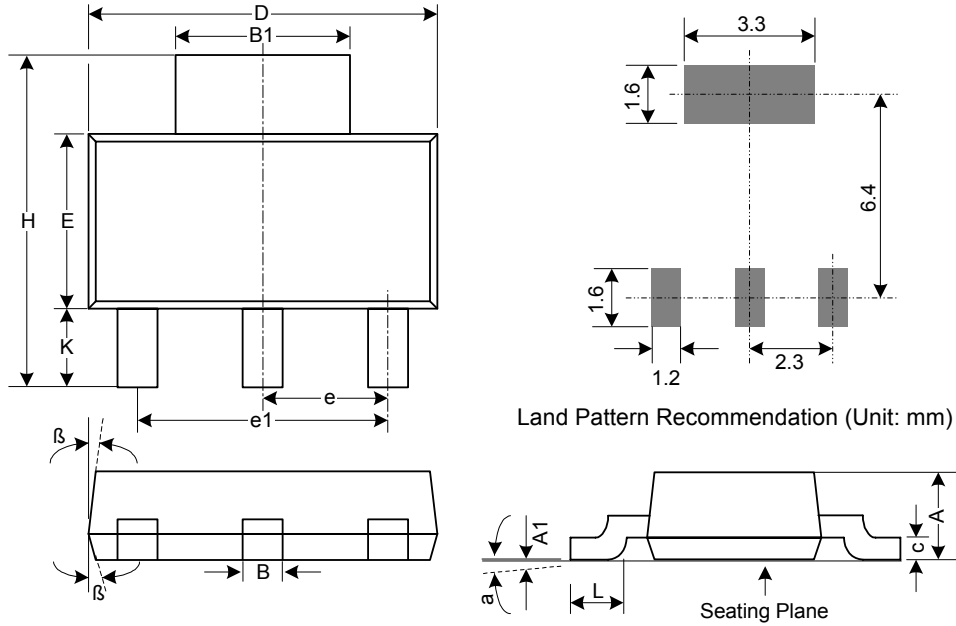
Identification code	Output version
DA	AP1117-ADJ
DB	AP1117-1.5V
DC	AP1117-1.8V
DG	AP1117-1.9V
DD	AP1117-2.5V
DE	AP1117-3.3V
DF	AP1117-5.0V

(5) TO263-3L



### ■ Package Dimension

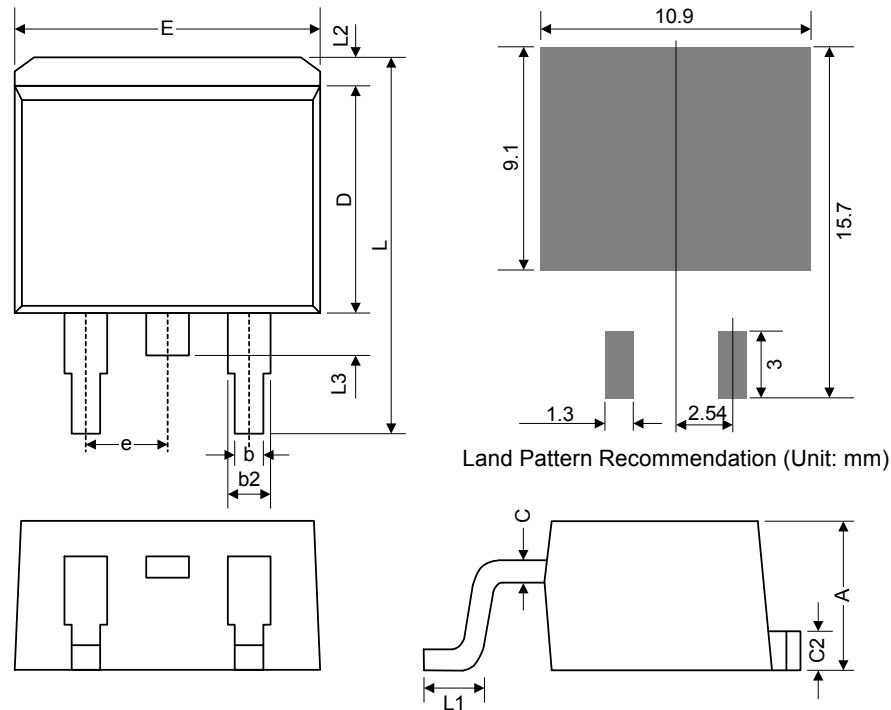
(1) SOT223



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.50	1.65	1.80	0.059	0.065	0.071
A1	0.02	0.05	0.08	0.001	0.002	0.003
B	0.60	0.70	0.80	0.024	0.028	0.031
B1	2.90	-	3.15(Ref.)	0.114	-	0.124(Ref.)
c	0.28	0.30	0.32	0.011	0.012	0.013
D	6.30	6.50	6.70	0.248	0.256	0.264
E	3.30	3.50	3.70	0.130	0.138	0.146
e	2.3 Basic			0.091 Basic		
e1	4.6 Basic			0.181 Basic		
H	6.70	7.00	7.30	0.264	0.276	0.287
L	0.91	1.00	1.10	0.036	0.039	0.043
K	1.50	1.75	2.00	0.059	0.069	0.079
$\alpha$	0°	5°	10°	0°	5°	10°
$\beta$	-	13°	-	-	13°	-

## 1A Low Dropout Positive Adjustable or Fixed-Mode Regulator

(2) TO263

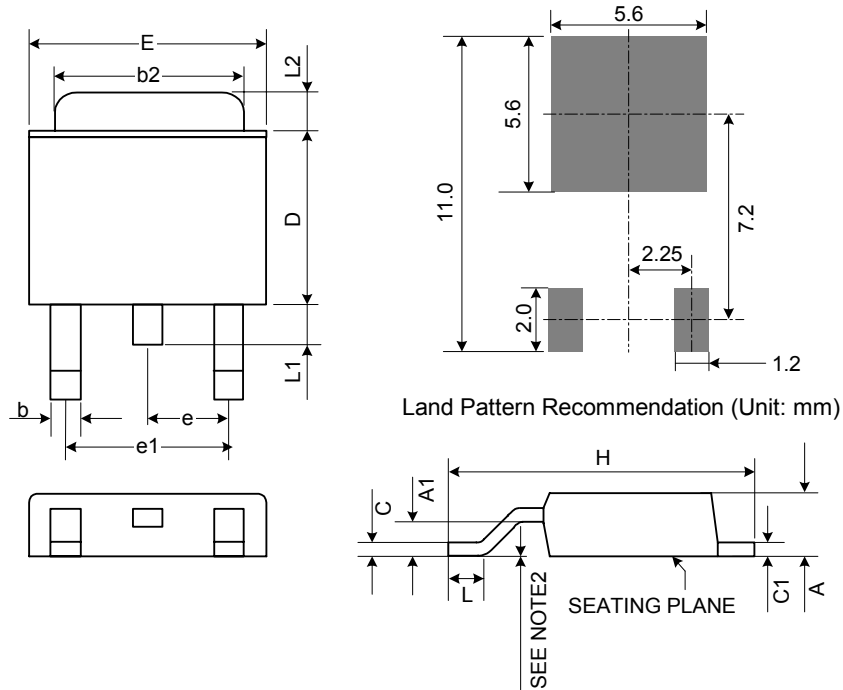


Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	4.06	4.45	4.83	0.160	0.175	0.190
b	0.51	0.75	0.99	0.020	0.030	0.039
b2	1.14	1.27	1.40	0.045	0.050	0.055
C	0.38 TYP.			0.015 TYP.		
C2	1.14	1.27	1.40	0.045	0.050	0.055
D	8.65	9.15	9.65	0.341	0.360	0.380
E	9.65	9.97	10.29	0.380	0.393	0.405
e	2.54 BSC.			0.100 BSC.		
L	14.61	15.24	15.88	0.575	0.600	0.625
L1	2.28	2.54	2.80	0.090	0.100	0.110
L2	-	1.30	2.92	-	0.051	0.115
L3	1.27	1.52	1.78	0.050	0.060	0.070



## 1A Low Dropout Positive Adjustable or Fixed-Mode Regulator

(3) TO252



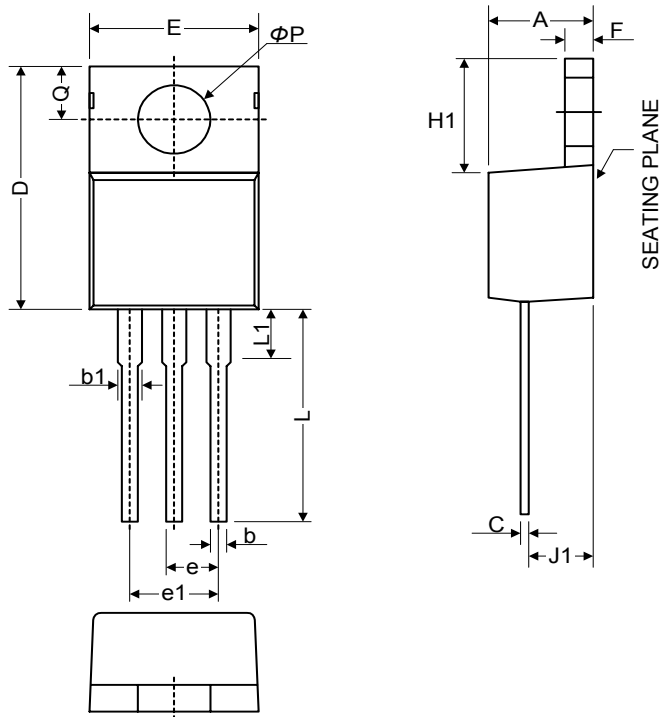
Notes:

1. JEDEC Outline: TO-252 AB
2. Mils suggested for positive contact at mounting.

Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	2.18	2.29	2.39	0.086	0.090	0.094
A1	1.02	1.15	1.27	0.040	0.045	0.050
b	0.61 TYP.			0.024 TYP.		
b2	5.20	5.35	5.50	0.205	0.211	0.217
C	0.46	0.52	0.58	0.018	0.020	0.023
C1	0.46	0.52	0.58	0.018	0.020	0.023
D	5.33	5.57	5.80	0.210	0.219	0.228
E	6.35	6.58	6.80	0.250	0.259	0.268
e	2.25 BSC.			0.089 BSC.		
e1	4.50 BSC.			0.177 BSC.		
H	9.00	9.70	10.40	0.354	0.382	0.409
L	0.51	-	-	0.020	-	-
L1	0.64	0.83	1.02	0.025	0.033	0.040
L2	1.52	1.78	2.03	0.060	0.070	0.080

## 1A Low Dropout Positive Adjustable or Fixed-Mode Regulator

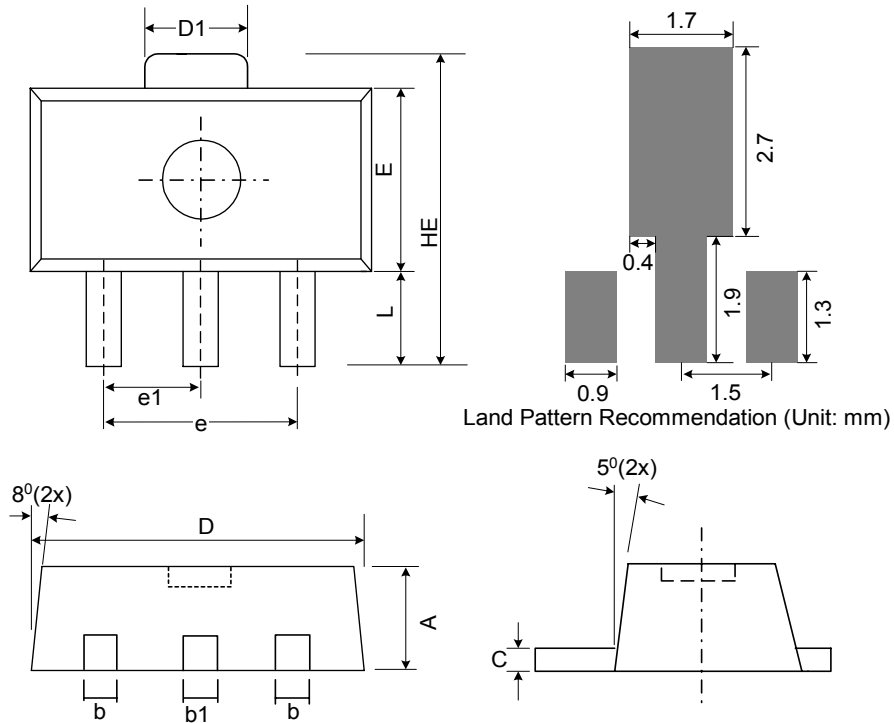
(4) TO220



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	3.55	4.20	4.85	0.140	0.165	0.191
b1	1.14	1.46	1.78	0.045	0.057	0.070
b	0.51	0.83	1.14	0.020	0.033	0.045
C	0.31	0.72	1.14	0.012	0.028	0.045
D	14.20	15.35	16.50	0.559	0.604	0.650
E	9.70	10.20	10.70	0.382	0.402	0.421
e	2.29	2.54	2.79	0.090	0.100	0.110
e1	4.83	5.08	5.33	0.190	0.200	0.210
F	0.51	0.95	1.40	0.020	0.037	0.055
H1	5.84	6.35	6.86	0.230	0.250	0.270
J1	2.03	2.48	2.92	0.080	0.098	0.115
L	12.72	13.72	14.72	0.501	0.540	0.580
L1	3.66	5.00	6.35	0.144	0.197	0.250
ØP	3.53	3.81	4.09	0.139	0.150	0.161
Q	2.54	2.98	3.43	0.100	0.117	0.135

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(5) SOT89



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.40	1.50	1.60	0.055	0.059	0.063
B	0.36	0.42	0.48	0.014	0.016	0.018
b1	0.41	0.47	0.53	0.016	0.043	0.051
C	0.35	0.39	0.43	0.014	0.015	0.017
D	4.40	4.50	4.60	0.173	0.177	0.181
D1	1.40	1.60	1.75	0.055	0.062	0.069
e	2.90	3.00	3.10	0.114	0.118	0.122
e1	1.45	1.50	1.55	0.057	0.059	0.061
E	2.35	2.48	2.60	0.093	0.098	0.102
HE	3.94	-	4.25	0.155	-	0.167
L	0.80	-	1.20	0.031	-	0.047